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TRANSMITTAL FORM

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Total Number of Pages in This Submission

Application Number	10/603,~~588~~ 528
Filing Date	June 25, 2003
First Named Inventor	Quigley, et al.
Art Unit	3747
Examiner Name	John T. Kwon
Attorney Docket Number	CECO-19

ENCLOSURES *(Check all that apply)*

- [x] Fee Transmittal Form
  - [x] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Reply to Missing Parts/ Incomplete Application
  - [ ] Reply to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
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- [x] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
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Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Krieg DeVault LLP		
Signature			
Printed name	J. Stephen Wills		
Date	December 9, 2008	Reg. No.	55,731

CERTIFICATE OF TRANSMISSION/MAILING

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Signature			
Typed or printed name	J. Stephen Wills	Date	December 9, 2008

PTO/SB/17 (10-08)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2009

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 540.00

Complete if Known	
Application Number	10/603,528
Filing Date	June 25, 2003
First Named Inventor	Quigley, et al.
Examiner Name	John T. Kwon
Art Unit	3747
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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	330	165	540	270	220	110	
Design	220	110	100	50	140	70	
Plant	220	110	330	165	170	85	
Reissue	330	165	540	270	650	325	
Provisional	220	110	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	52	26
Each independent claim over 3 (including Reissues)	220	110
Multiple dependent claims	390	195

Total Claims	Extra Claims	Fee ($)	Fee Paid ($)
_____ - 20 or HP =	_____	x _____	= _____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims	Extra Claims	Fee ($)	Fee Paid ($)
_____ - 3 or HP =	_____	x _____	= _____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $270 ($135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
_____ - 100 =	_____ / 50 =	_____ (round up to a whole number) x	_____	= _____

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	
Other (e.g., late filing surcharge): Appeal Brief Fee	$540.00

SUBMITTED BY

Signature		Registration No. (Attorney/Agent) 55,731	Telephone (317) 238-6297
Name (Print/Type)	J. Stephen Wills		Date December 9, 2008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit: 3747

Confirmation No.: 4126

Application No.: 10/603,528

Title: INTERNAL COMBUSTION ENGINE PISTON

Inventor: Quigley et al

Filing Date: June 25, 2003

Priority: June 28, 2002

Attorney Docket No: CECO-19

Examiner: John T. Kwon

Certificate Under 37 CFR 1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Mail Stop Appeal Brief – Patents Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

on December 9, 2008

(Signature)

J. Stephen Wills

(Printed Name)

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to a Notice of Appeal filed July 11, 2008, an Appeal Brief according to 37 CFR § 41.37 is provided. The Commissioner is hereby authorized to charge any fees that may be required, or credit any overpayment, to Deposit Account No. 12-2424.

I. REAL PARTY IN INTEREST

Per 37 CFR §41.37(c)(1)(i), the real party in interest is Cummins Inc., the assignee of record.

II. RELATED APPEALS AND INTERFERENCES

Per 37 CFR § 41.37(c)(1)(ii), the applicants, the applicants' legal representative, and the assignee are not aware of any related actions or interferences which will affect, be directly affected by, or have a bearing on the Appeal Board's decision in the present appeal.

III. STATUS OF CLAIMS

Per 37 CFR §41.37(c)(1)(iii), the status of the claims is as follows. Claims 42, 43, and 45-49 are rejected under 35 U.S.C. § 112. Claims 35-43, and 45-52 are rejected under 35 U.S.C. § 103(a). All rejections are being appealed on the grounds further explained hereinafter. The claims are presented in the Claims Appendix in accordance with 37 CFR §41.37(c)(1)(viii).

IV. STATUS OF AMENDMENTS

Per 37 CFR §41.37(c)(1)(iv), no claims have been amended since the Final Office Action.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Per 37 CFR §41.37(c)(1)(v), the following summarization provides a concise explanation of the subject matter defined in each of the independent claims involved in the appeal, and a concise explanation of each dependent claim argued in the appeal. This summarization refers to

page numbers, paragraph numbers, line numbers, and figure numbers of the present application as published on Jan. 19, 2006.

Independent claim 35 is directed to an apparatus for a piston with a solid head; a skirt; a longitudinal centerline; having a circumferential sidewall portion and a bottom wall portion defining a combustion bowl within the solid head at the first end with the annular surface extending around the combustion bowl; where the sidewall portion includes a sharp edge at an intersection of the annular surface and a part of the sidewall portion that extends substantially parallel to the centerline; a substantially rounded lip overhanging a portion of the combustion bowl and spaced axially from the sharp edge; an upwardly flared portion located between the sharp edge and the substantially rounded lip; where the combustion bowl at the sharp edge is round and the rounded lip is closer to the centerline than the sharp edge; and where the sharp edge directs fuel passing out of the combustion bowl away from the annular surface.

An exemplary embodiment of claim 35 is presented in FIG. 3 and the related text. FIG. 3 illustrates a piston 22 with a solid head 52, a skirt 54, and a centerline X. The piston 22 has a circumferential sidewall portion and a bottom wall portion defining a combustion bowl 51 within the solid head 52. The piston 22 includes an annular surface 50 extending around the combustion bowl 51. The sidewall portion includes a sharp edge 75 at an intersection of the annular surface 50 and a part of the sidewall portion 62 that extends substantially parallel to the centerline X. The piston 22 further includes a substantially rounded lip 27 overhanging a portion of the combustion bowl 51 and spaced axially from the sharp edge 75. The piston 22 further includes an upwardly flared portion 60 between the sharp edge 75 and the rounded lip 27. The combustion bowl 51 at the sharp edge is round, and the rounded lip 27 is closer to the centerline

X than the sharp edge 75. The sharp edge 75 is structured to direct fuel passing out of the combustion bowl 51 away from the annular surface 50.

Independent claim 42 is directed to a piston body having a longitudinal centerline and a first end surface; a combustion bowl defined in the piston body with an entrance adjacent to the first end surface; the piston body having a sharp edge portion extending around the entrance for directing fuel exiting the combustion bowl away from the first end surface; a rounded portion for receiving a fuel within the combustion bowl, where the rounded portion overhangs a portion of the combustion bowl and is located closer to the centerline than the sharp edge portion; and where the sharp edge portion is defined on a part of a wall of the combustion bowl extending in a direction parallel with the centerline.

An exemplary embodiment of claim 42 is presented in FIG.2 and the related text. FIG. 2 illustrates a piston body 22 having a longitudinal centerline X and a first end surface 50, and a combustion bowl 51 defined in the piston body 22, with an entrance . The piston body 22 has a sharp edge portion 61 extending around an entrance (the open face of the combustion bowl 51) for directing fuel 80 exiting the combustion bowl 51 away from the first end surface 50. The piston body 22 includes a rounded portion 27 for receiving a fuel 80 within the combustion bowl 51, where the rounded portion 27 overhangs a portion of the combustion bowl 51 and is closer ot the centerline X than the sharp edge portion 61. The piston body 22 further includes the sharp edge portion 61 defined on a part of the wall of the combustion bowl extending in a direction parallel with the centerline X.

Independent claim 50 is directed to a piston having a head portion and a skirt portion; where the head portion does not have internal cooling passages; the piston further having a longitudinal centerline and a first end surface with a combustion bowl defined therein and an

entrance adjacent to the first end surface; wherein the head includes a sharp edge portion extending around the entrance for directing fuel exiting the combustion bowl away from the first end surface; the piston further having a rounded portion for receiving a fuel thereon within the combustion bowl; where the rounded portion overhangs a portion of the combustion bowl and is closer to the centerline than the sharp edge.

An exemplary embodiment of claim 50 is presented in FIG. 3 and the related text. FIG. 3 illustrates a piston 22 having a head 52 with no internal cooling passages and a skirt 54. The piston 22 further includes a centerline X, and a first end surface 50 with a combustion bowl 51 defined therein and an entrance adjacent to the first end surface 50 (the open face of the combustion bowl 51). The head 52 includes a sharp edge portion 61 extending around the entrance for directing fuel exiting the combustion bowl 51 away from the first end surface 50. The piston 22 further includes a rounded portion 27 for receiving fuel thereon within the combustion bowl 51, where the rounded portion 27 overhangs a portion of the combustion bowl 51 and is closer to the centerline X than a sharp edge 75 of the sharp edge portion 61.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Pursuant to 37 CFR §41.37(c)(1)(vi), review of the following issues are presented in this appeal:

a) the rejection of claims 42, 43, and 45-49 under 35 U.S.C. § 112 as failing to comply with the written description requirement;

b) the rejection of claim 35 under under 35 U.S.C. § 103(a) as being unpatentable over Gaiser et al. (U.S. 6,539,910 B1) in view of Hofmann et al. (U.S. 5,605,126);

c) the rejection of claim 42 under under 35 U.S.C. § 103(a) as being unpatentable over Gaiser et al. (U.S. 6,539,910 B1) in view of Hofmann et al. (U.S. 5,605,126); and

d) the rejection of claim 50 under under 35 U.S.C. § 103(a) as being unpatentable over Gaiser et al. (U.S. 6,539,910 B1) in view of Hofmann et al. (U.S. 5,605,126).

VII. ARGUMENTS

The following remarks address the grounds of rejection in accordance with 37 CFR § 41.37(c)(1)(vii).

One set of rejections in the Appeal are based on 35 U.S.C. § 112. "To satisfy the written description requirement, a patent specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. See, e.g., *Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1319, 66 USPQ2d 1429, 1438 (Fed. Cir. 2003); *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d at 1563, 19 USPQ2d at 1116." See MPEP § 2163.I.

The remaining rejections are based on 35 U.S.C. § 103(a), asserting that each claim is unpatentable over Gaiser et al. (U.S. 6,539,910 B1) in view of Hofmann et al. (U.S. 5,605,126). The seminal case directed to application of 35 U.S.C. § 103 is *Graham v. John Deere*, 383 U.S. 1, 148 USPQ 459 (1966). From this case, four familiar factual inquiries have resulted. The first three are directed to the evaluation of prior art relative to the claims at issue, and the last is directed to evaluating evidence of secondary considerations. *See*, MPEP §2141.

The examiner bears the burden of establishing a prima facie case of obviousness. *See*, *In re Warner*, 379 F.2d 1011, 1016, 154 USPQ 173 (CCPA 1967), *cert. denied*, 389 U.S. 1057 (1968). To meet this burden, three basic criteria must be met. First, there must be some

suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *See*, MPEP § 2142, *citing In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). *KSR v. Teleflex*, 550 U.S. ___ (2007), makes clear that "the [Graham] factors continue to define the inquiry that controls." *KSR* at 2. For the following reasons, these criteria have not been met and a prima facie case of obviousness has not been established.

A. Claims 42, 43, and 45-49 reasonably convey to one skilled in the art that the inventors had possession of the claimed invention at the time the application was filed

Claim 42 includes the limitation "wherein said sharp edge portion is defined on a part of a wall of the combustion bowl extending in a direction parallel with said centerline" and is representative of the rejected matter in all of the claims rejected under 35 U.S.C. § 112. The Final Office Action (Final) states that the words of the application originally used "substantially parallel" (page 8, lines 4-5 – found at, e.g. paragraph [0018] as published) and that "arguments based on measurement of a drawing are futile in providing anticipation of a particular length." The Final further argues:

> Applicant argues that newly re-inserted limitation of "parallel..." is not new matter because it was supported by the specification as well as in the drawings. The examiner disagrees because absent any written description in the reference specification of quantitative values, arguments based on measurement

of a drawing are futile in providing anticipation of a particular length. In Re Wright, 193 USPQ 332, 335.

Furthermore, applicant argues that one skilled in the art would have understood the description of substantial parallel, combined with figures. The examiner disagrees because the general rule for interpreting the meaning of a word in a claim is: unless the word has special meaning in the art or the word has been given a certain definition by the specification, the ordinary dictionary definition controls. The definition of "substantial" is described as "being largely but not wholly that which is specified" (Merriam-Webster's collegiate dictionary, 10th edition). Since the word "substantial" has no special meaning in the art or the word has been given a certain definition by the specification, "substantially parallel" and "parallel" is substantially different and it did not supported by the specification.

Applicants respectfully submit that the reasoning used in the Final rejection is incorrect on two grounds.

First, interpretation of features from the drawings in the present case is in full compliance with the decision of In re Wright. In re Wright stated that length measurements and size ratios cannot be utilized from drawings that are not indicated to be drawings made to scale. See In re Wright, 193, USPQ 332. In the present case, parallelism is a geometric construct and not a sizing construct. Therefore, combining the drawings with the description elements of "the upstanding wall 62 is substantially parallel to the centerline X," (see paragraph [0018]) and that the configuration prevents the spray plume from spilling onto the surface 50 (see paragraph [0019]), one of skill in the art would understand a parallel upstanding wall 62 to be within the possession of the inventor at the time of filing the application. Any measurement suggested by the Applicants was not suggested to deduce a quantitative example from the drawing, but rather to confirm what is clear to the observer, i.e. that the embodiments illustrated in the present application are parallel or close to parallel, while the embodiments illustrated in Gaiser are significantly not-parallel.

Secondly, the selected definition for "substantial" in the Final is flawed. The Final has selected a definition for the adjective "substantial" rather than a definition for the adverb "substantially," and significantly has selected the fifth definition from the cited source (i.e. Merriam-Webster's Collegiate Dictionary, 10th Edition) with no statement as to why the selected definition should be deemed the most appropriate. Applicants note that the relevant meaning of "substantially" is whatever the term means to one of skill in the art, and not necessarily what the dictionary states. However, even if a dictionary is utilized, the adverb "substantially" has the following definition:

1. To a great extent or degree;
2. In a strong substantial way.[1]

Therefore, even if the suggestion of the Final to utilize a dictionary to define "substantially parallel" is accepted, the term would mean "to a great extent or degree parallel", which combined with a parallel drawing FIG. 2, and a slightly off-parallel drawing FIG. 3, would be understood by one of skill in the art to include an embodiment that was actually parallel.

Based on the preceding, Applicants assert that the application as originally submitted contains full support for embodiments where the upstanding wall 62 are parallel to the centerline X, that it would be clear to one of skill in the art that the inventor had possession of parallel embodiments, and therefore the rejections of claims 42, 43, and 45-49 under 35 U.S.C. § 112 are improper. Applicants request that the rejections under 35 U.S.C. § 112 be withdrawn.

[1] From WordNet® 3.0, © 2006 Princeton University, found at http://www.dictionary.com/, last visited Nov. 24, 2008. The source cited by the Final does not have a definition for the adverb form "substantially."

B. The asserted combination does not teach or suggest all limitations of claim 35

Claim 35 includes the limitations "a piston having a solid head" and "a part of said sidewall portion extending substantially parallel to the centerline."

The Final acknowledges that "Gaiser does not disclose a solid head portion of a piston", but states that "Hoffmann shows that the provision of a solid piston is old and well known in the art." It is well settled that a "proposed modification [that] would render the prior art invention unsatisfactory for its intended purpose" prevents finding a "suggestion or motivation to make the proposed combination." See, MPEP §2143.01.V and In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). In the present case, Gaiser is "a piston for diesel engines includ[ing] a piston body having a closed oil gallery", and is a device to provide direct lubrication of pin boss inner faces via the oil gallery. See Gaiser, Abstract and Summary. There is no embodiment of Gaiser that does not include an oil gallery 42, and the removal of the gallery 42 would render any disclosed embodiment of Gaiser inoperable. Therefore, the combination of a solid piston head from Hoffman is the exemplary combination contemplated in In re Gordon that "render[s] the prior art invention unsatisfactory for its intended purpose," and the combination is therefore improper.

The Final states that "a part of said sidewall portion extending substantially parallel to the centerline" is found at the sharp edge adjacent to the surface 14. Gaiser does not indicate whether the edge found at the intersection of the surface 14 and the piston sidewall is a "sharp edge", but the wall at that position is not "substantially parallel." The wall at that position appears to be significantly varied from parallel to the casual observation, and in fact is 12 degrees from parallel when measured. All embodiments disclosed in the present application are

described as substantially parallel, and are illustrated as parallel or within about 2 degrees of parallel. While In re Wright instructs that sizes and scales cannot be determined from drawings in the absence of description indicating that the drawings are to scale, the geometry and positioning of objects can be utilized, in combination with the written description, to indicate what would be understood to one of skill in the art. In the present application, the drawings and descriptions are all parallel or substantially parallel. In Gaiser, the drawings are not close to parallel and there is no description indicating the intended geometry; in fact, the feature at issue from Gaiser is not numbered or described in any manner. Therefore, it is improper to read Gaiser as disclosing a piston sidewall that is parallel or substantially parallel to a centerline.

Because the combination of Gaiser with Hoffman is improper, and because Gaiser does not include a sidewall portion that is parallel or substantially parallel, Gaiser or Gaiser with Hoffman do not disclose the features ""a piston having a solid head" or "a part of said sidewall portion extending substantially parallel to the centerline" from claim 35.

For the reasons presented above, Applicants submit that the rejection of claim 35 under 35 U.S.C. § 103 is improper.

C. The asserted combination does not teach or suggest all limitations of claim 42

Claim 42 includes the limitation, "wherein said sharp edge portion is defined on a part of a wall of the combustion bowl extending in a direction parallel with said centerline." Gaiser in view of Hoffman does not include this limitation for substantially similar reasons to those discussed regarding claim 35 preceding. Therefore, Applicants submit that the rejection of claim 42 under 35 U.S.C. § 103 is improper.

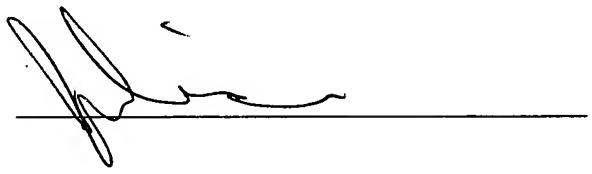
D. The asserted combination does not teach or suggest all limitations of claim 50

Claim 50 includes the limitation "a piston body having a head portion and a skirt portion, said head portion being free of internal cooling passages." For the reasons described regarding claim 35 preceding, an embodiment of Gaiser created without internal cooling passages would render Gaiser inoperable. Therefore, the limitation "a piston body having a head portion and a skirt portion, said head portion being free of internal cooling passages" is not suggested by Gaiser in view of Hoffman, and the rejection of claim 50 under 35 U.S.C. § 103 is improper.

VIII. CONCLUSION

For the foregoing reasons, reversal of the rejections by the Appeal Board is hereby requested.

Respectfully submitted,



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EVIDENCE APPENDIX

[NONE]

CLAIMS APPENDIX

1-34. (Canceled)

35. An apparatus, comprising:

a piston having a solid head, a skirt, a longitudinal centerline and a first end including an annular surface, said piston having a circumferential sidewall portion and a bottom wall portion defining a combustion bowl within said solid head at said first end with said annular surface extending thereround, said sidewall portion including a sharp edge at the intersection of said annular surface and a part of said sidewall portion extending substantially parallel to the centerline and a substantially rounded lip overhanging a portion of said combustion bowl and spaced axially from said sharp edge and an upwardly flared portion located between said sharp edge and said substantially rounded lip, said combustion bowl defined at said sharp edge is round and said rounded lip is closer to said centerline than said sharp edge is to said centerline, and wherein said sharp edge directs a fuel passing out of said combustion bowl away from said annular surface.

36. The apparatus of claim 35, wherein said sharp edge limits the fuel from passing out of said combustion bowl and onto said annular surface.

37. The apparatus of claim 35, wherein said sharp edge limits a fuel from passing out of said combustion bowl and across said annular surface.

38. The apparatus of claim 35, wherein said substantially rounded lip is located between said bottom wall portion and said sharp edge.

39. The apparatus of claim 35, wherein said part of said sidewall portion is located between said sharp edge and said upwardly flared portion.

40. The apparatus of claim 35 wherein said combustion bowl is substantially symmetrical about said longitudinal centerline;

wherein said substantially rounded lip is located between said bottom wall portion and said sharp edge, and wherein said substantially rounded lip overhanging a portion of said combustion bowl.

41. The apparatus of claim 35, wherein said piston is formed of one of a metallic, intermetallic, ceramic and composite material.

42. An apparatus, comprising:

a piston body having a longitudinal centerline and a first end surface, said piston body having a combustion bowl defined therein with an entrance adjacent said first end surface, said piston body having a sharp edge portion extending around said entrance for directing a fuel exiting said combustion bowl away from said first end surface and a rounded portion for receiving a fuel thereon within said combustion bowl, said rounded portion overhangs a portion of said combustion bowl and is located closer to said longitudinal centerline than said sharp edge portion is located to said centerline, and wherein said sharp edge portion is defined on a part of a wall of the combustion bowl extending in a direction parallel with said centerline.

43. The apparatus of claim 42, wherein said piston body has an outer circumferential surface, and wherein said sharp edge portion is located radially inward of said outer circumferential surface; and wherein said combustion bowl is symmetrical about said longitudinal centerline.

44. (Canceled)

45. The apparatus of claim 42, wherein said rounded portion extending circumferentially around said combustion bowl.

46. The apparatus of claim 45, wherein said piston body having a bottom surface defining a portion of said combustion bowl, and wherein said rounded portion is located between said bottom surface and said sharp edge portion.

47. The apparatus of claim 46, wherein said piston body having an upwardly flared portion defining a portion of said combustion bowl, and wherein said upwardly flared portion is located between said rounded portion and said sharp edge portion.

48. The apparatus of claim 42, wherein said piston body has an outer circumferential surface; wherein said sharp edge portion is located radially inward to said outer circumferential surface; wherein said combustion bowl is symmetrical about said longitudinal centerline, wherein said piston body having a bottom surface defining a portion of said combustion bowl, and wherein said rounded portion is located between said bottom surface and said sharp edge portion; wherein said piston body having an upwardly flared portion defining a portion of said combustion bowl, and wherein said upwardly flared portion is located between said rounded portion and said sharp edge portion; and wherein said rounded portion, said upwardly flared portion extend circumferentially around said bowl.

49. The apparatus of claim 42, wherein said piston body is free of internal cavities located between said combustion bowl and the outer surface of the piston body.

50. A piston, comprising:

a piston body having a head portion and a skirt portion, said head portion being free of internal cooling passages and having a longitudinal centerline and a first end surface with a combustion bowl defined therein with an entrance adjacent said first end surface, said head having a sharp edge portion extending around said entrance for directing a fuel exiting said combustion bowl away from said first end surface and a rounded portion for receiving a fuel thereon within said combustion bowl, said rounded

portion overhangs a portion of said combustion bowl and is located closer to said longitudinal centerline than said sharp edge portion is located to said centerline.

51. The apparatus of claim 50, wherein said sharp edge portion limits the fuel from passing out of said combustion bowl and onto said first end surface.

52. The apparatus of claim 50, wherein said sharp edge portion limits a fuel from passing out of said combustion bowl and across said first end surface.

RELATED PROCEEDINGS APPENDIX

[NONE]